ORDER

6850.28

PRECISION APPROACH PATH INDICATOR
PROJECT IMPLEMENTATION PLAN

March 30, 1988

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

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FOREWORD

This project implementation plan provides management direction for the implementation and acceptance of the Precision Approach Path Indicator (PAPI) system into the National Airspace System (NAS). It defines the major functional responsibility levels, management direction, and overall program guidance to all responsible levels within the FAA for the procurement and implementation of the Precision Approach Path Indicator.

for James R. Etgen
Director, Program Engineering Service

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CHAPTER 1. GENERAL

1. PURPOSE. This project implementation plan (PIP) provides technical guidance and direction for implementing the precision approach path indicator (PAPI) system into the National Airspace System (NAS).

2. DISTRIBUTION. This order is distributed to: branch level in the Program Engineering Service; division level in the Systems Maintenance, Systems Engineering, Office of Flight Standards, Office of Programs and Regulations Management, Air Traffic Operations, Air Traffic Plans and Requirements, Automation Service, Acquisition and Materiel, Office of General Counsel, and Office of Budget in Washington Headquarters; to branch level in the regional Airway Facilities, Air Traffic, Flight Standards and Logistics divisions; and to division level at the Facility Support Division, FAA Academy and FAA Depot at the Mike Monroney Aeronautical Center; and to Airway Facilities sector field offices, sector field units and sector field office units.

3. ACTION. Authority to change this order. The Director, Program Engineering Service, shall approve all changes to this order.

4.-19. RESERVED.

CHAPTER 2. PROJECT OVERVIEW

20. SYNOPSIS. As a result of the FAA's examination of the current airport visual navaids system and determination to comply with ICAO standards, the concept of a precision approach path indicator (PAPI) system has been developed. The precision approach path indicator program consists of procuring the equipment specified in FAA-E-2756, Four-Box Precision Approach Path Indicator, and installing and integrating the system as part of a visual aids establishment program.

21. PURPOSE. The purpose of the PAPI project is to provide vertical visual guidance to the pilot. The PAPI project will provide an international standard precision approach path indicator system.

22. HISTORY.

a. After examination of many different visual glide path systems in cooperation with the ICAO, the FAA adopted the PAPI as the national standard for a visual glide path system.

b. The specification FAA-E-2756 was baselined, project budgeted, and set aside for an 8A contractor. The contractor selected to build the PAPI was Sonicraft, Inc., of Chicago, Illinois. The contract was let October 15, 1985.

c. The PAPI contract (budgeted for in FY 85) called for design, production, testing and engineering support services for 90 PAPI systems. Testing of the PAPI was completed at the FAA Technical Center the week of November 16, 1987 and deliveries to the FAA Depot began on December 11, 1987.

23.-29. RESERVED.

CHAPTER 3. PROJECT DESCRIPTION

30. FUNCTIONAL DESCRIPTION. The PAPI system (figure 3-1) will consist of four lamp housing assemblies and a power and control assembly. Its primary function will be to provide the pilot visual descent guidance during a nonprecision approach to the runway with a secondary function of performing maintenance monitoring.

a. Lamp Housing Assembly. Each of the four lamp housing assemblies will be set at a slightly different angle (20 minutes apart) and will emit a beam of high-intensity light, the upper half showing red. As seen by the approaching pilot, the PAPI system will appear as a bar of four quick transition red/white light units whose on-glidepath signal (usually 3 degrees) is two red and two white lights. When the aircraft is slightly below glidepath (between 2 degrees, 50 minutes and 2 degrees, 30 minutes), the signal will change to three red and one white light. When the aircraft is further below the glidepath (below 2 degrees, 30 minutes), a fly-up signal of four red lights will be seen. Conversely, deviations above the glidepath will cause the outputs of the light units to appear to turn successively white. See figure 3-2 for PAPI system signal presentations.

b. Power and Control Assembly. Control of the PAPI will be available from the Tower Control Computer Complex (TCCC) at those Airport Traffic Control Towers (ATCT) so equipped. At non-TCCC ATCTs, control will be provided through the Remote Radio Control System (RRCS) and aircraft VHF/UHF radio (part time ATCTs only). The power and control assembly contains the input circuitry required to operate the PAPI system. The power and control assembly also supplies power for the PAPI system at two light intensity steps, one for daytime operation and one for night operation. The intensity of the lights is controlled by photoelectric circuitry.

c. Remote Monitoring Subsystem. The PAPI will have an RMS function built in which will monitor such things as current, voltage, tilt angle, on/off status, etc. The interface with the PAPI RMS will be an RMSC or MPS. In addition to providing equipment status and alarm information for maintenance purposes, operational status of the lights will be determined and provided to the TCCC. Should the airport be unmanned and control transferred to the ACCC, operational status information will be provided to the ACCC via the RMMS while operational control will be given directly to the pilot through use of the aircraft VHF transmitter.

d. Aiming Instrument and Calibration Bar.

(1) Clinometer. An FAA approved clinometer will be used to accurately adjust the LHA during cross-leveling (lateral), longitudinal leveling, and elevation setting.

(2) Calibration Bar. A calibration bar is provided to permit field checking and calibration of the clinometer provided with the PAPI.

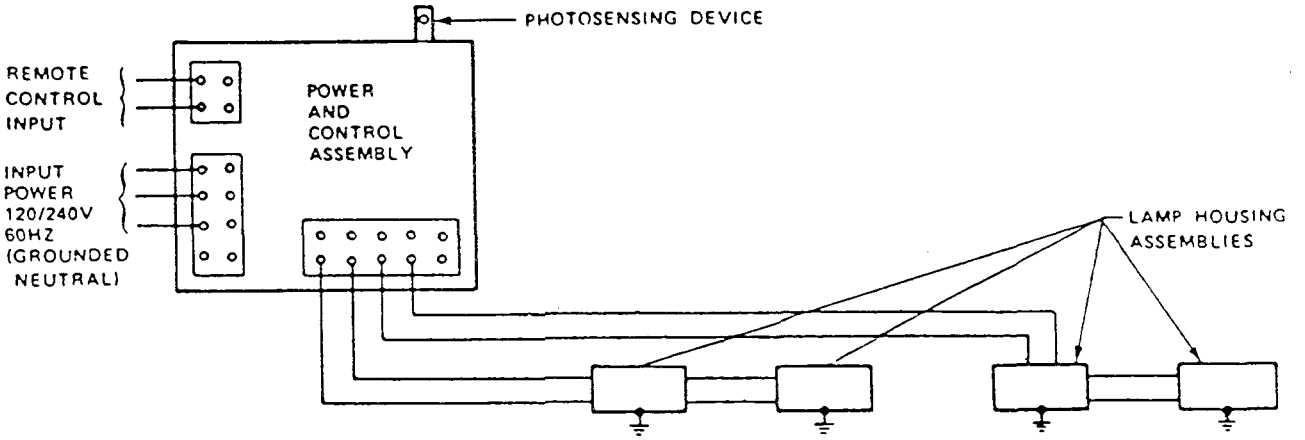

FIGURE 3-1. FUNCTIONAL RELATIONSHIP OF PAPI UNITS

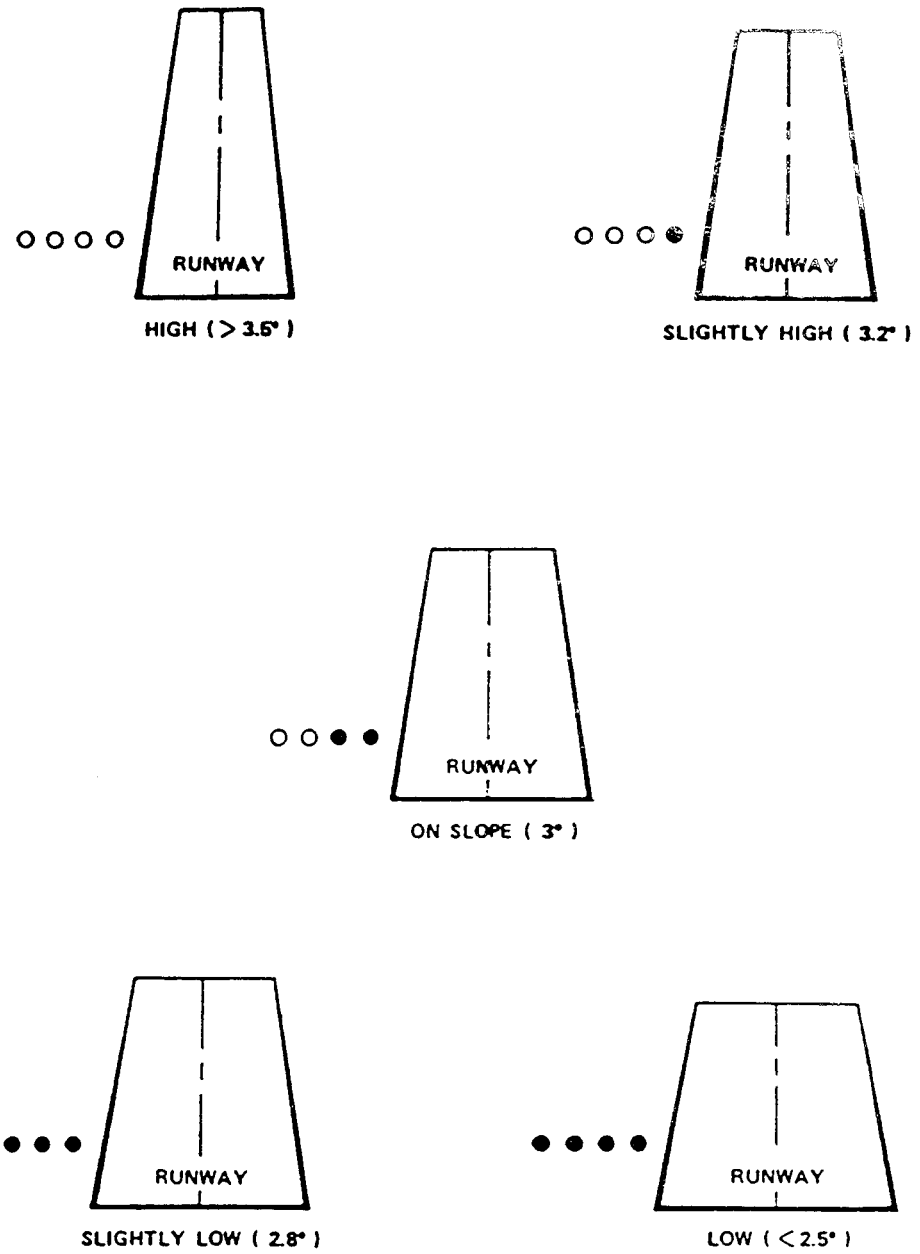

FIGURE 3-2. PAPI SYSTEM SIGNAL PRESENTATIONS

31. PHYSICAL DESCRIPTION.

a. Lamp Housing Assembly. The PAPI system consists of four lamp housing assemblies each containing three lamps and filters. The four light units will be arranged in a bar perpendicular to and on the left side of the runway and facing the approach end of the runway. The LHAs (figures 3-3 and 3-4) are installed on a rigid mounting base with three adjustable legs, with frangible couplings, to permit aiming of the light beam to any vertical angle from horizontal to up to six degrees. In addition the mounting and adjustment hardware permit transverse leveling where any mounting leg may be up to one inch higher or lower than any other leg after installation. Within the LHA, the lamp mounting assembly permits firm and positive positioning of three easily replaceable, PAR-64, quartz, 6.6A, 2000-hour lamps using seating lugs. Each of the three vertical planes formed by the three lamp seating lugs is perpendicular to the optical bench center line within +/-1 minute of arc. Focusing of the optical system is accomplished by adjusting the seating lugs. Three red filter assemblies with a transmittance of at least 15 percent when lamps are operated at full intensity are supplied with each LHA. In addition three projection lenses, recessed under an overhang to minimize direct impingement or splash-back of rain or snow on the lenses, are mounted in a vertical frame at the front of the LHA. A terminal block rated to carry 10 amperes at 250vac is provided at the rear of the LHA along with terminal blocks for signal wiring. The entire LHA excluding lamps and mounting legs weighs 86 pounds.

b. Power and Control Assembly. The power and control assembly is a compact, lightweight (50 pounds), self-cooled unit installed on frangible couplings behind the LHA furthest from the runway edge. The power and control assembly is contained in a cabinet which contains all the power and control components, including terminal blocks, cable clamps, grounding lugs and protective devices. In addition, the cabinet contains the photoelectric switching circuitry to control light intensity and a rotatable photosensing device mounted on the top surface of the cabinet. A current control device provides a constant rms load current through the lamps of the LHAs and an elapsed time indicator is installed to register the number of hours of operation at the high intensity setting. A panel-mounted true rms output current meter for series mounted lamps in the LHAs and a power supply to supply proper voltages and currents to operate the power and control assembly are also contained within the cabinet.

c. Remote Monitoring System. The RMS is contained within the power and control assembly and provides test points for all signals required to be monitored during checkout, alignment, calibration or during preventive maintenance. Test point controls and indicators are mounted on printed wiring boards and are accessible without the removal of components, modules or circuit cards. Test points and controls are terminated in a central location within the equipment cabinet and are easily accessible from the front of the circuit cage assembly without the use of extender boards. Test points and controls are connected to the remote maintenance monitoring subsystem (RMMS) through a RS-232c plug connector.

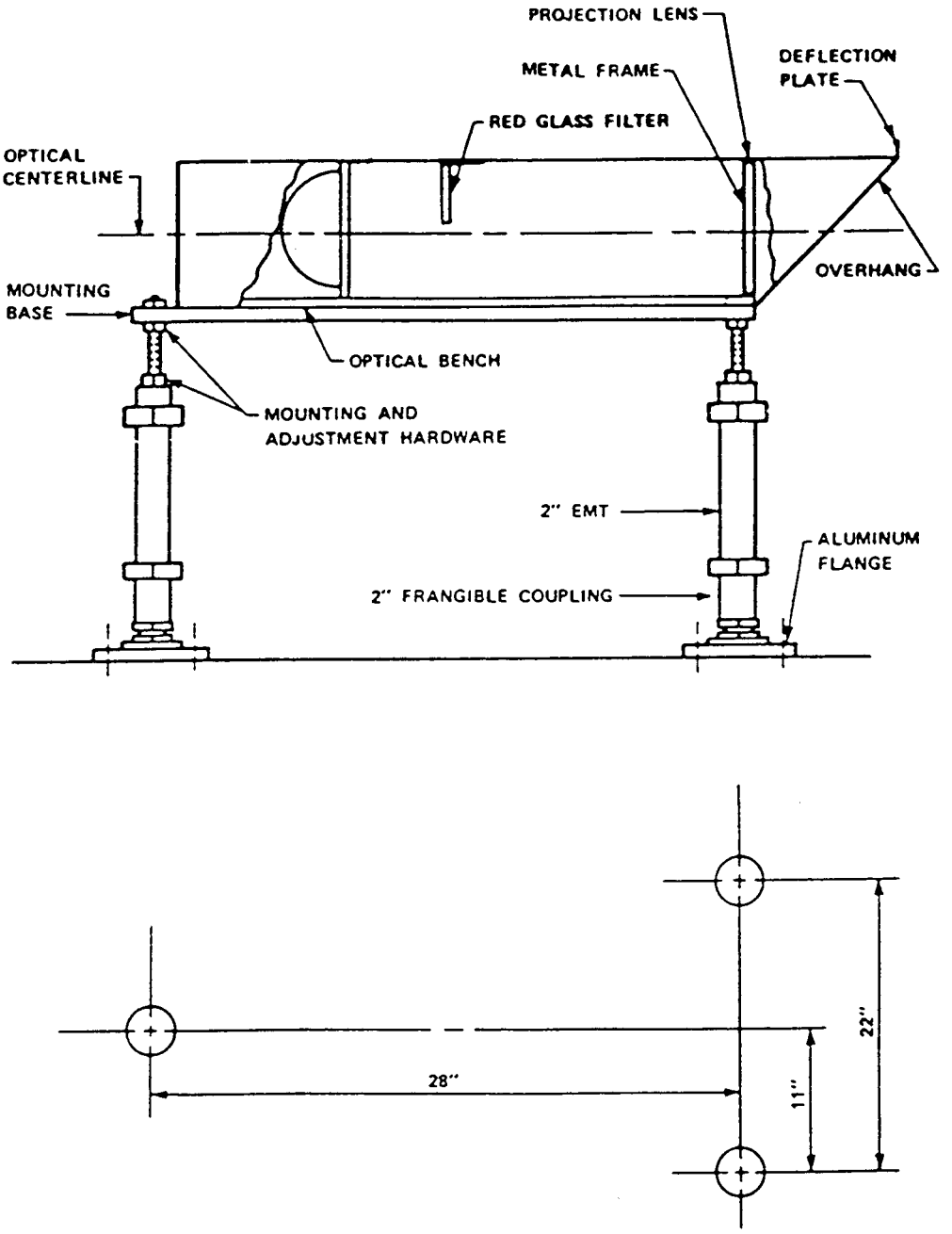

FIGURE 3-3. LAMP HOUSING ASSEMBLY (SIDE VIEW)

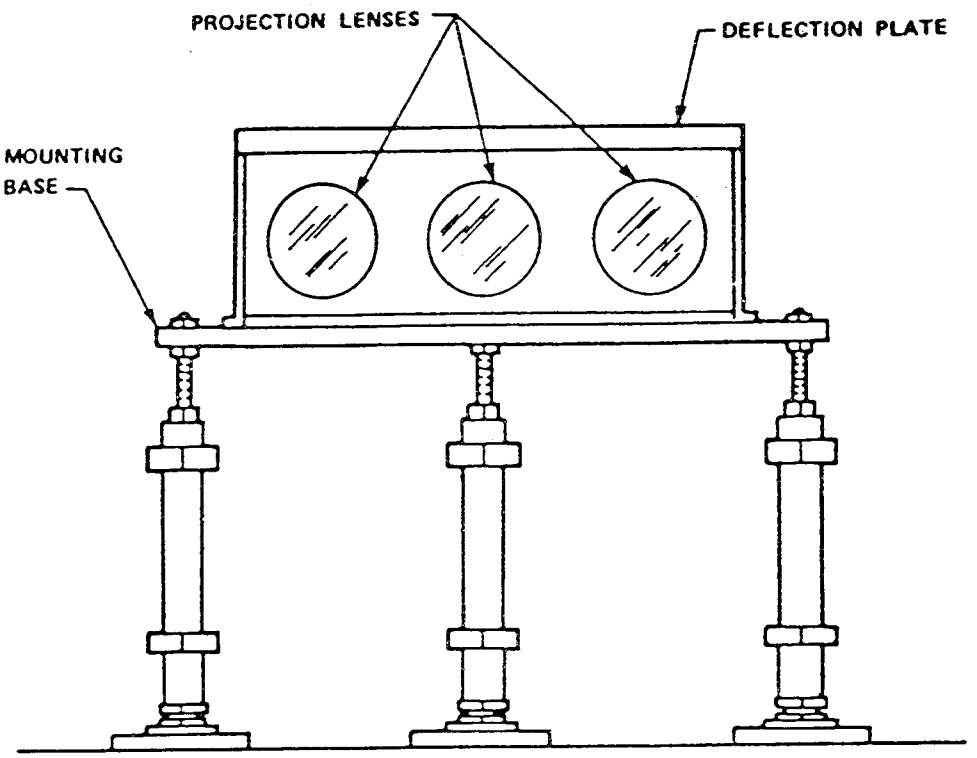

FIGURE 3-4. LAMP HOUSING ASSEMBLY (FRONT VIEW)

d. Aiming Instrument Set and Calibration Bar.

(1) Clinometer. The clinometer is a lightweight, rugged aluminum instrument. It has an accurate, direct-reading dial for setting the LHA to the desired angle from 0.0 to 6.0 degrees.

(2) Calibration Bar. The calibration bar is a stiff, hard aluminum bar that is designed for laying on a flat surface and that provides adjustment features to permit it to be leveled to a horizontal place.

32. SYSTEM REQUIREMENTS. PAPI system requirements include power, space, electromagnetic interference, and environmental considerations. Reliability, maintainability, and interchangeability are also design considerations of the system.

a. Power Requirements. Power requirements for the PAPI are outlined in FAA Order 6950.2C, Electrical Power Policy Implementation National Airspace System Facilities. The precision approach path indicator system operates on a single phase, 60Hz, 120/240VAC grounded-neutral power source. The lamp load consists of six 200 watt, PAR-64, quartz halogen, 6.6A, 2000-hour lamps in each of the 2-wire output circuits. The system is designed to suppress switching transients, and to withstand transient increases superimposed on the 120/240VAC rms power line input voltage that reach a peak value of 500 volts for as long as 50 milliseconds. In addition, the equipment is designed to withstand lightning transients superimposed on each input power line.

b. Siting. The PAPI must be sited and aimed so that it defines an approach path with adequate clearance over obstacles and a minimum threshold crossing height. If the runway has an electronic landing system glide slope already established, the PAPI is installed so that the visual glide path angle will coincide with the electronic glide slope. When an electronic glide slope is not present, one must determine a position and aiming for the PAPI which will produce the required threshold crossing height and clearance over obstacles in the area. Generally, the PAPI is installed in the configuration depicted in figure 3-5. FAA Order 6850.2A, Visual Guidance Lighting Systems, December 17, 1981, cites the siting criteria.

c. Electromagnetic Interference. Conducted interference levels on incoming ac power leads, control leads, and signal leads shall not exceed the limits for CE03 as defined in MIL-STD-461, except that below 150kHz the limits are allowed to be 20dB below the prescribed values. Radiated emission over the frequency range of 30kHz to 400MHz, at a distance of 20 feet shall not exceed the limit for RE02 of MIL-STD-461.

d. Reliability. Mean time before failure (MTBF) of the system, except for lamps, is not less than 2,500 hours. A system failure is defined as occurring when output tolerances from the power and control assembly (PCA) are exceeded, or when intensity step control is malfunctioning, or when components of the PCA cause the LHAs to cease operation.

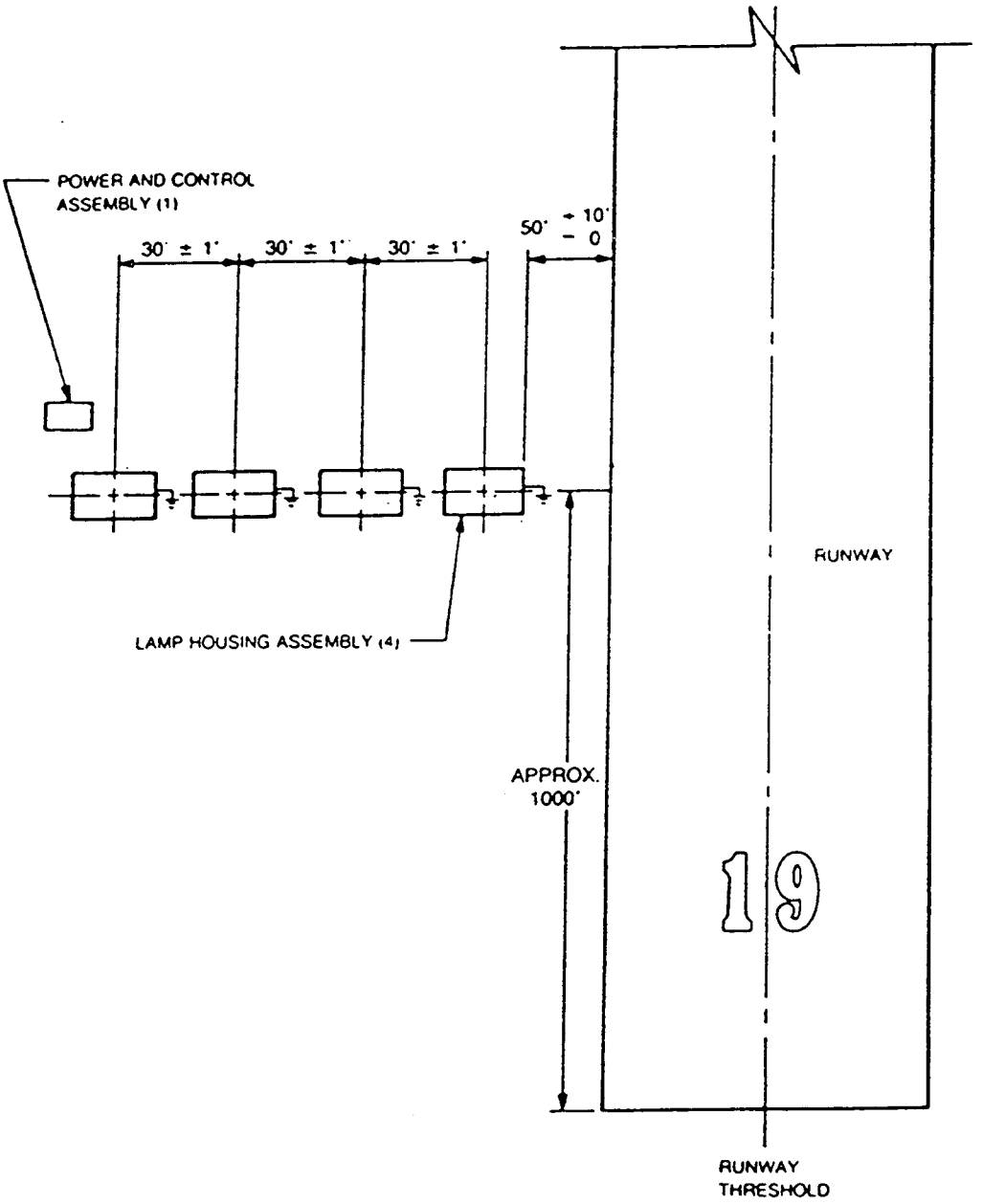

FIGURE 3-5. PAPI SYSTEM CONFIGURATION

e. Maintainability. The PAPI system shall have a mean time to restore (MTTR) of not more than 20 minutes with no single restoration exceeding 3 hours in duration. Mean periodic maintenance time (MPMT) for the PAPI system shall not exceed 2 hours per 3 months, including routine inspection. The above values are established under the assumption that spare parts for failed components are available at the site.

f. Interchangeability. All parts of the unit furnished under a single procurement will be manufactured to a tolerance that permit interchangeability of any part with a like part of any other unit.

33. INTERFACES. The PAPI system has the capability of being monitored by the remote maintenance monitoring system (RMMS) described in FAA-E-2782, Remote Maintenance Monitoring System, Core System/Segment Specification, when provided. Its other major interface point will normally be the Remote Control Interface Unit described in FAA-E-2663, Interface Unit MALSR Remote Control, through which the PAPI interfaces with the Remote (Radio) Control System described in FAA-E-2723, Remote (Radio) Control System. The PAPI will also interface with the TCCC (where installed).

34.-39. RESERVED.

CHAPTER 4. PROJECT SCHEDULE AND STATUS

40. PROJECT SCHEDULES AND GENERAL STATUS. The procurement of the PAPI equipment is divided by fiscal year. The FY-85 contract, DTFA01-86-Y-01002, is a design/production contract which will provide 90 PAPI systems for delivery to the depot. The FY-86/87 buy is a contract expected to be let in June 1988 for an additional 65 PAPI systems. And the FY-88 requirement is an add-on package to the FY-86/87 contract to buy an additional 31 PAPI systems.

41. MILESTONE SUMMARY SCHEDULE. The current project schedule is shown in table 4-1. Project events are scheduled in relationship to the date of contract award. The dates listed are for those milestones completed or anticipated. This table is by no means an all inclusive list of project milestones necessary for project completion.

EVENT	DATE
FY85	
Contract Award	15 Oct 85@
First System Delivered to T & E Site	28 Aug 87@
First System Delivery FAA (Depot)	11 Dec 87@
Last System Delivery FAA (Depot)	31 Sep 88
FY86-87	
Contract Award	30 Jun 88
First System Delivery FAA (Depot)	27 Dec 89
Last System Delivery FAA (Depot)	27 Mar 90
FY88	
First System Delivery FAA (Depot)	08 Apr 90
Last System Delivery FAA (Depot)	22 May 90

@Milestones Accomplished

TABLE 4-1 MILESTONE SUMMARY SCHEDULE

42. INTERDEPENDENCIES AND SEQUENCE. Delivery of the first complete PAPI system, to the regions sometime after March 1988. The following projects were identified as having interdependencies with the PAPI project. Because of the broad variation in site requirements, discussion of specific effects of each program on a site-by-site basis is beyond the scope of this PIP.

a. The Airport Cable Loop Program. The Airport Cable Loop Program establishes a network with all of the airport's power and control cables. The PAPI will precede the Airport Cable Loop Program at some locations which might lead to their being dropped from control cable loops, although power cable loops may still be required.

b. The Airport Telecommunications Program. The Airport Telecommunications Program will establish the specifications and criteria for a reliable and flexible distribution system for low activity and medium activity airports. The Airport Telecommunications Program is related to all airport projects which require buried cable for control signals or communications between sites. The Airport Telecommunications Program investigates frequency interference and alternative communications media within the NAS plan. The PAPI impacts this program only in the Landing area since the PAPI does require some buried cable for PAPI system to function. Remote Maintenance Monitoring System (RMMS) program will have to be considered on a case-by-case basis for each air facility affected.

c. The Remote Maintenance Monitoring System. The Remote Maintenance Monitoring System (RMMS) program has been developed to provide maintenance monitoring and control equipment for FAA facilities so that performance monitoring, certification, and control could be accomplished from centralized work centers. In some cases the RMMS program may not be fully implemented until some time after installation of the PAPI system has been completed. In these situations, the reduction in the frequency of onsite maintenance visits derived from the integration of the PAPI RMS with the RMMS may not be realized until some time after the PAPI has been installed.

43.-49. RESERVED.

CHAPTER 5. PROJECT MANAGEMENT

50. PROJECT MANAGEMENT, GENERAL. This section describes the organizations with the Program Engineering Service (APS) that are directly responsible for PAPI program management.

a. Program Engineering Service (APS). The Program Engineering Service manages, directs, and executes the FAA's engineering and management activities related to facilities design, air navigation, landing aids, and air traffic control facilities and equipment to ensure that the NAS is efficient, economical and responsive to operational needs.

b. Navigation and Landing Division (APS-400). The Navigation and Landing Division is the principal element of the service responsible for the design, development, and implementation of systems, programs and facilities requirements for navigation and landing systems.

c. Current Landing/Lighting Systems Program (APS-440). The Current Landing/Lighting Systems Program office is the principal element of the division responsible for design, development, and implementation responsibilities for instrument landing systems and landing aids.

d. Precision Approach Path Indicator Program. The PAPI Program Manager is supported by engineering and is responsible for managing the design, development, and implementation activities associated with the precision approach path indicator system. The duties include:

(1) Management. Planning, scheduling and managing the PAPI program from design through commissioning, logistics support, training, and program completion. Responsible for systems engineering, system design, man-machine interface, component design and related functional, technical, and performance characteristics.

(2) Equipment Provisioning. Provides, in conjunction with the Acquisition and Materiel Service and Systems Maintenance Service, technical guidance to define logistics support for proper provisioning of PAPI equipment.

(3) Modernization Input. Developing service input for the modernization or in-service improvement of PAPI equipment.

(4) Technical Officer. Providing engineering advice and consultation to contracting officer during procurement, serving as technical officer, and reviewing contractor requests and progress payments.

(5) Cost Data. Developing and providing cost data, controlling assigned funds, and adjusting program schedules and objectives as necessary.

(6) Technical Installation Instructions. Preparing technical installation instructions.

(7) Maintenance Instructions. Preparing maintenance instructions, identifying training, provisioning and test requirements, and directing the preparation of maintenance technical handbooks.

(8) Testing. Reviews and approves manufacturers' equipment test procedures. Establishes requirements and approves plans for test and evaluation of PAPI engineering activities of the FAA technical center.

(9) Inventory. Manages in transit material for construction and installation. Maintains currency of material systems and control over PAPI equipment inventory.

(10) Installation. Management of installation activities for current and future systems to assure a high level of system performance.

(11) Acceptance. Providing research, engineering, development, design and systems analyses associated with acquisition and acceptance of hardware and software.

51. PROJECT CONTACTS. This paragraph lists PAPI project contacts and their addresses.

a. PAPI Cluster Manager. Al Thomas, APS-400, Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, D.C. 20591, FTS 267-8488, (202) 267-8488.

b. PAPI Program Manager. Frank Roepcke, APS-440, Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, D.C. 20591, FTS 267-8518, (202) 267-8518.

c. PAPI Project Engineer. Clesson McDonald, APS-440, Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, D.C., 20591, FTS 267-8495, (202) 267-8495.

d. PAPI SEIC Support. Dennis Hughes, SCT, DC1030, 475 School St., S.W., Washington, D.C. ,20024, (202) 646-6999.

52. PROJECT COORDINATION. The PAPI project requires coordination with other services within the FAA, divisions within APS and with the contractor onsite representative during PAPI installation. Coordination requirements are contained in this paragraph.

a. Maintenance Engineering Division (ASM-100). ASM-100 reviews PAPI procurement specifications to ensure the design meets the reliability and maintainability requirements and supports the general maintenance philosophy. ASM-100 also coordinates the development of an integrated logistic support plan for the PAPI system acquisition and develops maintenance standards and plans for implementation of maintenance concepts.

b. Maintenance Operations Division (ASM-200). ASM-200 participates in the development and review of PAPI maintenance plans. In addition, ASM-200 develops national Airways Facilities sector staffing standards for the PAPI program and validates PAPI maintenance staffing requirements. The program manager ensures the PAPI project is in conformance with staffing, training, certification policies, guidelines and requirements.

c. Materiel Management Division (ALG-200). ALG-200 directs the implementation of standards for the management and control of the PAPI material inventory and supply distribution systems.

d. Contracts Division (ALG-300). ALG-300 performs cost/price analyses of contractor's proposals and participates as a member of the Source Evaluation Board on PAPI procurements subject to the contracting officer. In addition, ALG-300 provides procurement support for the PAPI programs and plans, and places, and administers contracts for the PAPI equipment. ALG-300 also designates a contracting officer (CO) who is responsible for all contractual matters. The CO is the only individual authorized to approve contract changes impacting price, delivery or schedule.

e. Industrial Division (ALG-400). ALG-400 performs factory inspection of the PAPI. ALG-400 assigns a quality/reliability officer (QRO) at the time the PAPI contract is awarded. The QRO is the FAA's representative at the contractor's facility and is responsible for verifying quality control. The QRO is directed by FAA policy and procedure, and by the terms and conditions of the contract.

f. FAA Depot (AAC-400). AAC-400 accepts deliveries of PAPI systems from the manufacturer and manages the dissemination of PAPI systems at the regions request. AAC-400 is responsible for PAPI logistics support.

g. FAA Academy (AAC-900). AAC-900 provides maintenance training and coordinates with ASM-200 in the development of a training plan.

h. Technical Training Division (APT-300). APT-300 analyzes training proposals prepared by ASM-200 and initiates action to meet training requirements.

i. FAA Aviation Standards National Field Office, Flight Programs Division (AVN-200). This office conducts commissioning flight inspections of radio controlled PAPI systems only when deemed necessary to assure proper system performance. The complete system will be inspected at the first routine inspection of nearby or associated navigational aids. The requirement to commission the PAPI is dependent upon the funding source used to purchase the system and the installation method. Current policy recognizes FAA and ADAP funded visual approach systems that are installed and ground checked employing a FAA approved aiming device. In accordance with agency directives, these do not require a commissioning flight inspection. A commissioning flight inspection is required for those systems for which flight inspection

requests are made, which require obstacle clearance waivers, or which do not meet the funding or installation requirements. The Aviation Standards National Field Office is in the process of revising the Visual Approach Slope Indicator chapter to OA P 8200.1, United States Standard Flight Inspection Manual to clarify requirements. This revision will include specific flight inspection maneuvers and requirements that are unique to PAPI, add remote radio control requirements, and clarify the general guidance to all systems.

j. FAA Regional Office.

(1) The FAA regional office through established administrative structures requests needed PAPI equipment. The FAA regional office coordinates with all responsible parties to assure adequate funding, establish system commissioning/service availability dates, assign project field representatives and determine utility availability.

(2) The FAA regional office assures compatibility and configuration for the facility installation of the visual aids.

(3) The regional office provides field engineering as required to support preparations for the installation of PAPI equipment and the installation of RRCS equipment to monitor/control the visual aids; orders government furnished materials (GFM) for tools and test instruments to support PAPI installation and acceptance; tailors installation drawings to be site specific; initiates work orders and travel authorization; and assigns field personnel. If air-to-ground radio control equipment is required, the Region will purchase the unit.

(4) The FAA regional Office coordinates the complete installation, alignment, and operational tests on the visual aid facility to assure full compliance with FAA specifications and performance.

(5) The FAA regional office conducts integration tests based on the requirements of the Master Test Plan upon installation of the visual aid, which includes the ground-to-ground RRCS and the air-to-ground radio control, prior to JAI.

k. Contractor. The PAPI contractor, when requested by APS-440, provides engineering support services for onsite advice, including technical supervision to FAA technicians and the installation contractor concerning proper installation or operation of PAPI.

53. PROJECT RESPONSIBILITY MATRIX. Figures 5-1 illustrates the FAA organizations responsible for the implementation of each significant function of the PAPI project.

54. PROJECT MANAGERIAL COMMUNICATIONS. The PAPI program manager within APS-440 is the focal point for all internal project communication. Organizations supporting the PAPI program designate a representative to

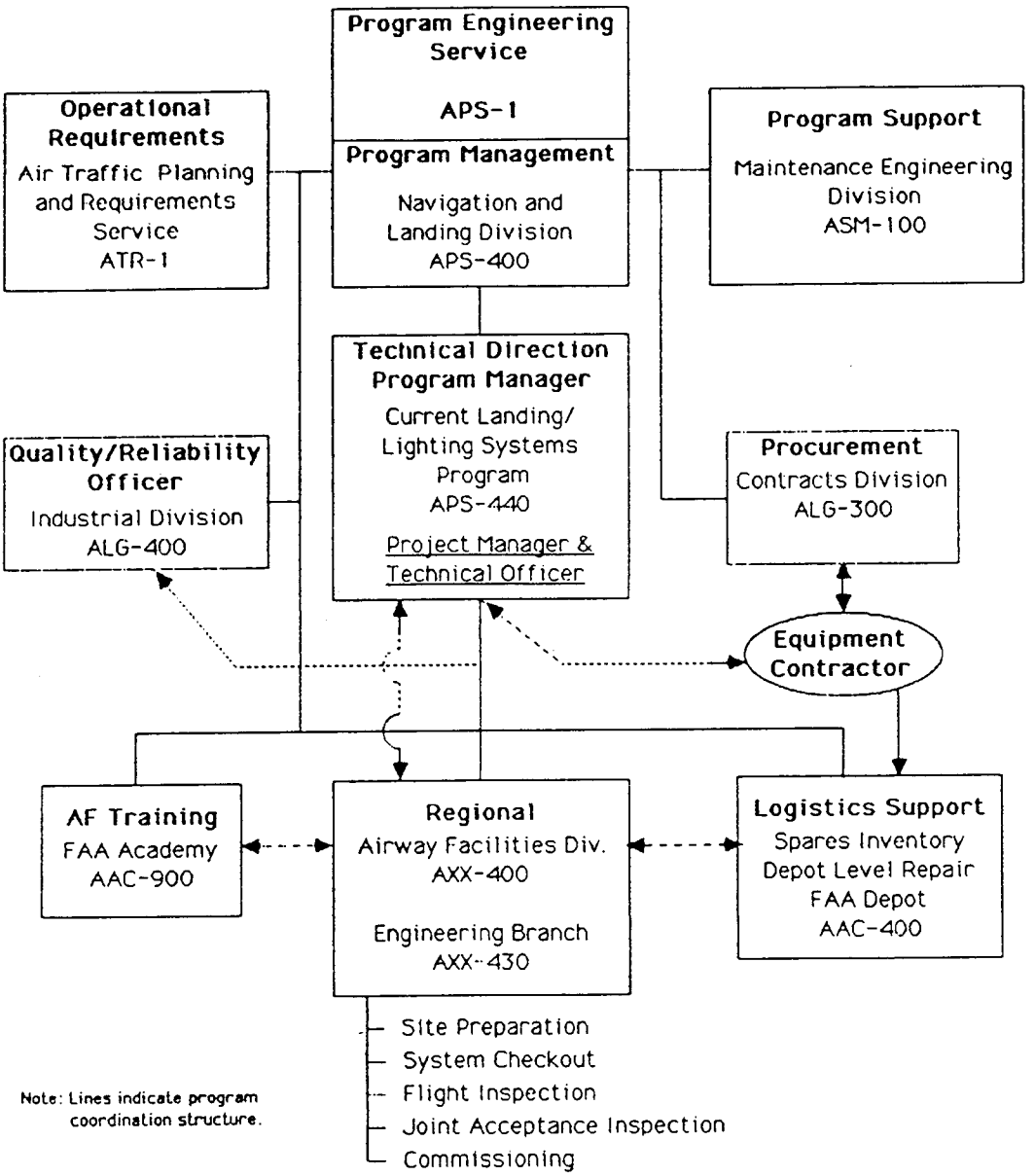

FIGURE 5-1. PROJECT RESPONSIBILITY MATRIX

maintain close communication with the Current Landing/Lighting Systems Program office. Supporting organizations maintain communications with both the contractor and internally within the FAA. The meetings listed below are the regularly scheduled project meetings, or conferences.

a. The National Airspace Integrated Logistics Support (NAILS) Conference. These conferences are held to ensure that there is an interrelated, unified and iterative approach to the managerial and technical activities which support the National Airspace System (NAS). During these conferences issues effecting logistics management, maintenance planning, supply support, test and support equipment, manpower and training support, support facilities, technical data, and packing, handling, storage and transportation are discussed and resolved. These meeting are held on a semiannual basis at the FAA headquarters.

b. Program/Project Status Review Boards. These boards are held on a monthly basis at the FAA headquarters to discuss project status and to resolve problems and issues effecting all phases of the project from the time that the requirements are established until system deployment has been completed.

55. IMPLEMENTATION STAFFING. There are no personnel requirements peculiar to the implementation phase of the project.

56. PLANNING AND REPORTS. None required.

57. APPLICABLE DOCUMENTS. Within this PIP the following documents have been referenced.

a. AC 150/5345-49A, Specification L-854, Radio Control Equipment, August 8, 1986.

b. Contract DTFA01-86-Y-01002, for Precision Approach Path Indicator Systems, October 15, 1985.

c. FAA-E-2663, Interface Unit MALSR Remote Control, November 18, 1976.

d. FAA-E-2723, Remote (Radio) Control System, December 21, 1982.

e. FAA-E-2756, Four-Box Precision Approach Path Indicator, February 26, 1985.

f. FAA-E-2782, Remote Maintenance Monitoring System, Core System/Segment Specification, July 14, 1986.

g. FAA Order 1800.8E, NAS Configuration Management, July 11, 1985.

h. FAA Order 6000.26A, Reliability and Maintainability Policy, May 14, 1982.

i. FAA Order 6030.45, Facility Reference Data File, March 28, 1974.

j. FAA Order 6850.2A, Visual Guidance Lighting Systems, December 17, 1981.

k. FAA Order 6950.2C, Electrical Power Policy Implementation National Airspace System Facilities, November 1987.

l. NAS-SR-1000, System Requirements Specification, March 1985.

m. NAS-SS-1000, Functional and Performance Requirements for the National Airspace System General, December 1986.

58.-59. RESERVED.

CHAPTER 6. PROJECT FUNDING

60. PROJECT FUNDING STATUS, GENERAL. Project funding for the PAPI system is 17.25M. Funding for PAPI has been provided through FY-85, 86 and 87 for 186 systems. These funds will be used to procure and implement the PAPI systems described in FAA-E-2756. Funding for FY-88 has not been approved. Funding data for FY-89 and beyond is not available.

61.-69. RESERVED.

CHAPTER 7. DEPLOYMENT

70. GENERAL DEPLOYMENT ASPECTS. Deployment of PAPI systems is conducted by the FAA Depot at the Mike Monroney Aeronautical Center and the FAA regions. As regional funds become available, requests from the regions to satisfy airport PAPI requirements are honored by the depot. PAPI equipment is shipped by the depot to the site where it is stored for installation. Installation of the equipment is the responsibility of the region. Table 7-1 depicts the Deployment Readiness Review (DRR) Schedule.

Event	Date
SEIC Review Date	10/09/87
DRR Report Scheduled	11/02/87
DRR Briefing Scheduled	11/13/87
First Delivery (Depot) Date	12/11/87

TABLE 7-1. PAPI (FY 85) DRR SCHEDULE

71. SITE PREPARATION. The regions are responsible for preparing the sites where PAPI equipment will be installed. Site preparation includes planning for installation and integration with the remote radio control system at both the tower and at the runway location. Considerations for site preparation include weather conditions and concurrent construction activities.

72. DELIVERY. One PAPI system was delivered by the contractor to the FAA Technical Center in Atlantic City, New Jersey, for system testing on August 28, 1987 and on November 16, 1987. Shipments of the PAPI systems to the FAA Depot began December 11, 1987, and will be available to the regions under the constraints of fiscal year funding. The depot ships equipment to the regions as requests are made and in accordance with the quantities called out in the project status report (PSR). Projected delivery dates are contained in chapter 4. Implementation of the project is scheduled to be completed in December of 1992.

73. INSTALLATION PLAN. The FAA regional office shall coordinate the receipt, installation and evaluation of all equipment required to form the PAPI system. The PAPI equipment shall be installed in accordance with national standard drawings and standards revised to fit the individual site. The regional office shall coordinate the complete installation, alignment, and operational tests on all identified PAPI interfaces to assure full compliance with FAA specifications and performance. The Contractor shall provide engineering support services for onsite advice, including technical

supervision to FAA technicians and the installation contractors concerning the proper interfacing of the RRCS, TCCC and RMS to the PAPI when required. Performance analysis and evaluation reports shall be forwarded to the FAA Regional Office for acceptance.

74. CONFIGURATION MANAGEMENT PLAN. Configuration Management (CM) is the process used to identify and document the functional and physical characteristics of a configuration item, control changes to those characteristics, and record and report change processing and implementation status. Configuration items of concern for this implementation are the Lamp Housing Assemblies, Power and Control Assembly, and the Remote Monitoring Subsystem Interface baselines. The configuration management discipline shall be applied to all configuration items included in the PAPI baselines to ensure compatibility between elements within the PAPI. All additions and changes to the PAPI baselines shall be proposed in the form of a case file, and shall be reviewed for recommended approval or disapproval by a Configuration Control Board (CCB). All changes to the NAS site design baseline, the Lamp Housing Assemblies, the Power and Control Assembly, and the Remote Monitoring System Interface must be processed and approved by the Navigation and Landing Cluster (APS-400) CCB.

a. Acquisition Phase Configuration Management.

(1) The Navigation and Landing Cluster (APS-400) Configuration Control Board (CCB) controls the establishment of and changes to the PAPI hardware baselines during the acquisition phase. For PAPI matters, the APS-400 CCB will include members from ASM-150, AES-200, ACT-100, AES-500, AFS-200 and the Configuration Management Division, AES-410. The APS-400 CCB is responsible for ensuring that the functional, performance, and interface requirements allocated to the PAPI hardware subsystems are reflected in the baselines, and in any changes to those baselines until product acceptance. The APS-400 CCB is also responsible for ensuring that baseline documentation is accurate and reflects PAPI operational requirements. Baseline documentation includes specifications and interface control documents (ICDs). The APS-400 CCB retains this CM responsibility until the hardware installation is commissioned at each site.

(2) The transition of configuration management responsibilities associated with PAPI hardware products occurs at acceptance by the APS-400 CCB designated representative of the contractor's delivered, installed, integrated, and tested hardware product. Hardware product acceptance is based on successful operational readiness demonstration (ORD) of the complete PAPI system.

(3) At product acceptance, the change control functions and CCB records associated with hardware products transition from the APS-400 CCB to the Maintenance Engineering (ASM-100) CCB.

b. Operational Support Phase Configuration Management. During the operational support phase, and for the entire life-cycle of the implemented hardware enhancements, configuration management functions will consist of maintenance and change control management of site (Level III Design) as well as product baseline.

The ASM-100 CCB assumes baseline and change control management of the lamp housing assemblies, and power control assembly hardware products and associated peripherals as each product is commissioned for operational service (via Memorandum of Agreement), and of related NAS site design baselines (including logistics and training). The ASM-100 CCB is responsible for change control management of the PAPI hardware product baseline by MOA. Hardware product baselines are maintained by National Airway Engineering Field Support Sector (ASM-150) personnel in the field. The contractor shall provide engineering changes to ASM-150 when the changes are released, and prior to field implementation. ASM-150 shall evaluate the changes and approve the change for field implementation via a case file. The configuration management functions assigned to the ASM-100 CCB are described in the ASM-100 CCB charter.

75.-79. RESERVED.

CHAPTER 8. VERIFICATION

80. FACTORY VERIFICATION. The PAPI contractor performs design qualification and production unit tests at the factory to validate and demonstrate that the PAPI system meets the specification requirements of FAA-E-2756.

a. Design Qualification Tests. The contractor conducts design qualification tests to demonstrate that the PAPI system meets every specification requirement through inspection, analysis, or actual qualitative or quantitative tests.

b. Production Unit Tests. Production unit tests for the PAPI system are performed on every PAPI system produced and include visual inspections, a two-hour operational test followed by a performance test, and a photometric test.

81. CHECKOUT. After installation of equipment by the regions, FAA personnel conduct checkout tests in accordance with the contractor developed equipment instruction books. The procedures followed include testing electrical and mechanical hardware interfaces and verifying system performance and adequacy of spare parts.

82. CONTRACTOR INTEGRATION TESTING. Not applicable. See paragraph 84.

83. CONTRACTOR ACCEPTANCE INSPECTION (CAI). Inspection of the PAPI occurs at the contractor's facility. Quality control inspections are performed by the Quality/Reliability Officer (QRO) in accordance with FAA requirements. All equipment is accepted at the contractor's facility following successful completion of test.

84. FAA INTEGRATION TESTING. The FAA regional office shall conduct integration tests upon installation of the PAPI system prior to recommendations for system acceptance.

85. SHAKEDOWN AND CHANGEOVER. Shakedown testing is performed by FAA regional personnel at the PAPI site to determine that the PAPI system is ready for full operation as part of the NAS. After the successful completion of JAI and commissioning, the local AF maintenance representative assumes maintenance responsibility for the system.

86. JOINT ACCEPTANCE INSPECTION (JAI). A joint acceptance inspection is conducted in accordance with FAA Order 6030.45, Facility Reference Data File to gain the consensus of involved office that the PAPI project has been completed in accordance with applicable standards and specifications and that the facilities are capable of providing the services required within established standards and tolerances. The JAI ensures compliance with requirements in the following areas:

a. Facility Construction and Equipment Installation.

b. Facility/System/Equipment Performance.

c. Facility Technical Performance Documentation and Maintenance Reference Data.

d. Facility Logistics Support.

e. Final Acceptance and Commissioning.

87.-89. RESERVED.

CHAPTER 9. INTEGRATED LOGISTICS SUPPORT

90. MAINTENANCE CONCEPT. The concept of maintenance for the PAPI System shall consist of both site and depot repair. Maintenance Technicians (either FAA and/or contractor) will replace PAPI components down to the lowest replaceable units (LRU) and may perform limited repair/corrective and preventative maintenance functions as required, onsite. FAA Depot maintenance will consist of receipt and repair/replacement of failed LRUs. These functions can be performed by either the FAA and/or a commercial contractor.

91. TRAINING. The training program for the PAPI Project is contained in the PAPI Subsystem Training Plan. Assignment of training quotas for the regions will be made by ASM-210 for Airway Facilities (AF) personnel. Projected training requirements by individual work centers/facilities and principal training milestones are included in this training plan. Training for equipment procured under the FY-85 buy is being provided by Graph Tech, Inc. For the FY-86/87 buy, initial training of FAA AF personnel will be conducted by the contractor at the contractor's facility. Training courses are developed and conducted for those technicians who perform actual maintenance on PAPI systems and FAA Academy personnel who will be generating academy resident training courses. Training course graduates will be able to configure the PAPI system for normal operation and system testing using manufacturers instructions, FAA Orders and Specifications. They will possess sufficient knowledge to troubleshoot and repair to LRU level and to perform and document all periodic maintenance.

92. SUPPORT TOOLS AND TEST EQUIPMENT. This section describes support and test equipment, including all common and special tools, as well as any connectors or other interface devices necessary to connect the support equipment to the end item or Unit Under Test (UUT). Test equipment is supported at the AF sector office having responsibility for the visual aid facility.

a. Common tools, test/support equipment, interface devices and connectors for maintenance of the PAPI System. The contractor provides a list of the common tools, test/support equipment, interface devices and connectors required for maintaining PAPI project/equipment at all levels of maintenance.

b. Special tools, special test/support equipment and special interface devices for maintaining PAPI System. Special tools, test/support equipment, and/or interface devices required to support the PAPI System will be held at a minimum. Special tools or test equipment required for initial adjustments (i.e. aiming instrument), testing, and/or maintenance of the PAPI project are provided with the equipment.

93. SUPPLY SUPPORT. The FAA Depot is responsible for providing supply support to the PAPI in the forms of maintaining inventory records and the master FAA catalog, and interfacing with the Federal Cataloging System.

94. VENDOR DATA AND TECHNICAL MANUALS. Instruction books for the PAPI system are provided by the contractor and reviewed by the FAA prior to acceptance. Instruction books are provided with each PAPI system that is delivered. Other technical manuals to be provided by the contractor include, reliability, maintainability documentation, and test procedures, and drawings.

95. EQUIPMENT REMOVAL. No equipment removal is required.

96. FACILITIES. Not applicable.

97.-99. RESERVED.